



## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14 MAR 2005

Applicant's file reference 02-AI	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
Application No. 0300642	International filing date (day/month/year) 16.09.2003	Priority date (day/month/year) 16.09.2002
Patent Classification (IPC) or both national classification and IPC		
SCHE UNIVERSITEIT DELFT et al.		
<p>1. This International preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 3 sheets.</p>		
<p>3. This report contains Indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand  16.04.2004	Date of completion of this report  03.01.2005	
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Glod, G  Telephone No. +49 89 2399-7373 	

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/NL 03/00642**

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

2-9 as originally filed  
1, 1a received on 25.09.2004 with letter of 23.09.2004

**Claims, Numbers**

2-10 as originally filed  
1 received on 25.09.2004 with letter of 23.09.2004

**Drawings, Sheets**

1 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	5,6
	No: Claims	1-4, 7-10
Inventive step (IS)	Yes: Claims	
	No: Claims	1-10
Industrial applicability (IA)	Yes: Claims	1-10
	No: Claims	

2. Citations and explanations

**see separate sheet**

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**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

- D1: BEUN J J ET AL: 'Aerobic granulation in a sequencing batch airlift reactor' WATER RESEARCH, XP004312290
- D2: DANGCONG P ET AL: 'Aerobic granular sludge-a case report' WATER RESEARCH, XP004151609
- D3: MORGENROTH E ET AL: 'Aerobic granular sludge in a sequencing batch reactor' WATER RESEARCH, XP004098442
- D4: BEUN J J ET AL: 'N-REMOVAL IN A GRANULAR SLUDGE SEQUENCING BATCH AIRLIFT REACTOR' BIOTECHNOLOGY AND BIOENGINEERING. XP001124872

2. The subject-matter of claims 1-4 and 7-10 does not fulfill the requirements of Article 33(2) PCT (Novelty).

- 2a. D1 discloses aerobic granulation in a sequencing batch airlift reactor. The influent is added during 2 minutes, then aeration takes place during 170 min and after 3 minutes settling the effluent is withdrawn (page 703, right column). Acetate is consumed within a few minutes (see page 705, 3.1 and figure 2). Since the dissolved oxygen level (DO) is not 100% air saturation (see pages 705 and 704, left columns), the feeding takes place under oxygen-depleted conditions. D1 is considered to anticipate the subject-matter of claims 1-4 and 7-10 of the present application.
- 2b. D2 describes the formation of granules in an sequencing batch reactor. The filling, reaction, settling and withdrawing periods were respectively 0.5, 0.75, 2.5 and 0.25h long (p. 890, right column). The activity of the granules was strongly dependent on the oxygen supply, but not on the oxygen concentration (page 893, left column). DO during the feeding period was nearly zero (page 893, left column), meaning oxygen-depleted. D2 is prejudicial to the novelty of the subject-matter of claims 1-4, 7, 8 and 10 of the present application.
- 2c. D3 shows the degradation of municipal wastewater in a sequencing batch reactor. The operational strategy in phase IV (Table 3) was: filling 13 min; aerated reaction

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220 min; settling 1 min and draw 6 min. During filling no aeration takes place; oxygen is consumed, which leads to oxygen-depleted conditions. D3 contains all the features of claims 1-4, 7, 8 and 10 of the present application and destroys their novelty.

- 2d. The method described in D4 for removing nitrogen in a granular sludge sequencing batch airlift reactor (page 83, general experimental observations) is novelty-destroying for the subject-matter of claims 1-4, 7, 8 and 10 of the present application.
- 3. The subject-matter of claims 1-10 does not fulfill the requirements of Article 33(3) PCT (Inventive step).
  - 3a. The subject-matter of remaining claims 5 and 6 does not appear to concern more than obvious modifications of the teaching of D1 for which no inventive step has been demonstrated. It is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to solve the problem posed.
  - 3b. The examiner is not convinced that the present application allows to solve a problem that is not solved in D1-D4. The example shown in the description only used a model water that contained acetate, which is easily taken up by the bacteria, but does not provide any comparison with respect to the prior art.

**4. Additional comments:**

The subject-matter of claims 1, 4 and 10 does not fulfill the requirements of Article 6 PCT.

The expression 'oxygen-depleted' is unclear since a skilled person does not exactly know as of which oxygen concentration said expression can be used. The expressions 'at least partial', 'more slowly' and 'more quickly' used in claims 4 and 10 are vague and unclear and leave the reader in doubt as to the meaning of the technical features to which they refers, thereby rendering the definition of the subject-matter of said claims unclear.

WO 800302-A1/LM/yt

Method for the treatment of waste water

The present invention relates to a method for the treatment of waste water comprising an organic nutrient, wherein the waste water is brought into contact with microorganisms-comprising sludge particles, an oxygen-comprising gas is fed to the sludge particles, and the method further comprises the settling of the sludge particles and the discharge of organic nutrient-depleted waste water.

Such a method is known in the art, for example, from US 3,864,246. Waste water having a high rate of biological oxygen demand (BOD) is mixed with sludge flocs. The thus obtained sludge flocs-containing waste water is brought into contact with oxygen (air). The conditions chosen augment the growth of sludge flocs (that is to say biomass particles) that have improved settling properties. This reduces the time necessary for separating the microorganisms (in particular bacteria) that provide biological breakdown, from the waste water.

*<< insert page 1a >>*  
A drawback of the known method, despite the improved settling velocity, is that the implementation of the method requires a relatively large surface area, that is to say large-scale purification occupies an undesirable amount of space.

It is an object of the present application to improve the method, while occupying less space in comparison with the known method.

To this end the method according to the invention is characterised in that

- in a first step the waste water is fed to sludge granules,
- after the supply of the waste water to be treated an oxygen-comprising gas is introduced in a second step, with the granules being in a fluidised condition and

1a

<< BEUN J J ET AL disclosed an aerobic granulation in a sequencing batch airlift reactor, wherein an aerobic granular sludge was cultivated while intensely mixed.

DANGCONG P ET AL discloses the observation of aerobic granular sludge in a sequencing batch reactor in which a synthetic urban wastewater containing sodium acetate as an organic substrate was fed, and dissolved oxygen (DO) was controlled at low concentration.

MORGENROTH E ET AL discloses the culturing of granules in a laboratory scale sequencing batch reactor (SBR) under aerobic conditions.

BEUN J J ET AL relates to N-Removal in a granular sludge sequencing batch airlift reactor.

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EP-A-0 776 864 discloses a process for the aerobic biological purification of water. >> \_\_\_\_\_

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*Amended* CLAIMS 1

1. A method for the treatment of waste water comprising an organic nutrient, wherein the waste water is brought into contact with microorganisms-comprising sludge particles, an oxygen-comprising gas is fed to the sludge particles, and the method further comprises the settling of the sludge particles and the discharge of organic nutrient-depleted waste water, **characterised** in that
- 5 - in a first step the waste water is fed to sludge granules, *under oxygen-depleted conditions*
- 10 - after the supply of the waste water to be treated an oxygen-comprising gas is introduced in a second step, with the granules being in a fluidised condition and
- in a third step, a settling step, the sludge granules are allowed to settle.

- 15 ~~1. A method according to claim 1, **characterised** in that in the first step the waste water is fed to a bed of sludge granules, and the sludge granules settle in the third step, forming a bed of sludge granules.~~

3. A method according to claim 2, **characterised** in that the waste water is fed to the bed of sludge granules at a rate such as to avoid fluidisation of the bed.

4. A method according to one of the preceding claims, **characterised** in that at least a part of the nutrient-depleted waste water is discharged in the third
- 25 step, after at least partial settling.

5. A method according to one of the preceding claims, **characterised** in that at least a part of the nutrient-depleted waste water is discharged during the feeding of waste water to the bed of sludge granules in
- 30 the first step.

6. A method according to one of the preceding claims, **characterised** in that the discharge of nutrient-depleted waste water is the consequence of displacement due to waste water being fed to the bed of sludge gran-
- 35 ~~ules.~~